

1. (Amended four times) A plasma processing system, said plasma processing system comprising:

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a substantially cylindrical plasma processing chamber used to process a substrate, said substantially cylindrical plasma processing chamber including a top region located on the top surface of said substantially cylindrical plasma processing chamber and a peripheral region located on a surface surrounding the periphery of said substantially cylindrical plasma processing;

Sub 4-
a gas flow system coupled to said plasma processing chamber, said gas flow system controlling flow of input gas into at least two different regions of said plasma processing chamber; said input gas being a source gas suitable for use to etch said substrate in said plasma processing chamber;

wherein said at least two different regions include at least one peripheral region and at least one top region of said plasma processing chamber; and

wherein said peripheral region of said plasma processing chamber does not include any points of said top region of said plasma processing chamber.

19. (Thrice Amended) A plasma processing system for processing a substrate, comprising:

Sub 4-
a substantially cylindrical plasma processing chamber within which a plasma is both ignited and sustained for said processing, said plasma processing chamber having no separate plasma generation chamber, said plasma processing chamber having an upper end and a lower end;

a coupling window disposed at an upper end of said plasma processing chamber.

an RF antenna arrangement disposed above a plane defined by said substrate when said substrate is disposed within said plasma processing chamber for said processing;

an electromagnet arrangement disposed above said plane defined by said substrate, said electromagnet arrangement being configured so as to result in a radial variation in the static magnetic field topology within said plasma processing chamber in the region proximate said RF antenna when at least one direct current is supplied to said electromagnet arrangement, said radial variation being effective to affect processing uniformity across said substrate;

a dc power supply coupled to said electromagnet arrangement, said dc power supply having a controller to vary a magnitude of said at least one direct current, thereby changing said radial variation in said magnetic field topology within said plasma processing chamber in said region proximate said antenna to improve said processing uniformity across said substrate; and

a gas flow system coupled to said plasma processing chamber, said gas flow system controlling flow of input gas into at least two different regions of said plasma processing chamber, said input gas being a source gas suitable for use to etch said substrate in said plasma processing chamber;

wherein said at least two different regions include at least one peripheral region located at region located on the surface surrounding the periphery of said substantially cylindrical plasma processing chamber and at least one top region located at a top surface of said substantially cylindrical plasma processing chamber; and

wherein said peripheral region of said plasma processing chamber does not include any points of said top region of said plasma processing chamber.

37. (Thrice Amended) A plasma processing system for processing a substrate, comprising:

a substantially cylindrical plasma processing chamber within which a plasma is both ignited and sustained for said processing, said plasma processing chamber having no separate plasma generation chamber, said plasma processing chamber having an upper end and a lower end;

a coupling window disposed at an upper end of said plasma processing chamber.

an RF antenna arrangement disposed above a plane defined by said substrate when said substrate is disposed within said plasma processing chamber for said processing;

an electromagnet arrangement disposed above said plane defined by said substrate, said electromagnet arrangement being configured so as to result in a radial variation in the static magnetic field topology within said plasma processing chamber in the region proximate said RF antenna when at least one direct current is supplied to said electromagnet arrangement, said radial variation being effective to affect processing uniformity across said substrate;

a dc power supply coupled to said electromagnet arrangement, said dc power supply having a controller to vary a magnitude of said at least one direct current, thereby changing said radial variation in said magnetic field topology within said plasma processing chamber in said region proximate said antenna to improve said processing uniformity across said substrate; and

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a gas flow system coupled to said plasma processing chamber, wherein said gas flow system controls release of input gas, suitable for etching the substrate, into a first and a second region within said plasma processing chamber, said first region being a top central region located at the top surface of said substantially cylindrical plasma processing chamber and said second region being a peripheral region located on a surface surrounding the periphery of said substantially cylindrical said plasma processing chamber; and

wherein said first and second regions do not have any points in common.